

## WHAT IS CLAIMED IS:

1. An I.V. flush syringe assembly comprising:

5 a barrel having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

10 a plunger including an elongate body portion having a proximal end, a distal end and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel; and

anti-reflux means for minimizing stopper deflection when fluid has been delivered from said chamber and said stopper is in contact with said distal wall.

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2. The syringe assembly of claim 1 wherein said anti-reflux means includes said stopper being supported by a flexible base at said distal end of said plunger, said base being more flexible than said stopper in response to proximally directed forces on said stopper.

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3. The syringe assembly of claim 1 wherein said anti-reflux means includes said stopper being connected to a base at said distal end of said plunger, said stopper being configured to be more flexible at its proximal end than at its distal end in response to proximally directed forces on said stopper.

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4. The syringe assembly of claim 1 wherein said anti-reflux means includes said stopper having a recess in its proximal end and a flexible base extending distally from said plunger, said base positioned at least partially in said recess, said base being softer than said stopper and deflectable upon the application of a proximally directed force on said stopper.

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5        5.     The syringe assembly of claim 1 wherein said anti-reflux means includes a resilient portion in said plunger between said proximal end and said distal end of said plunger, said resilient portion being more deflectable than said stopper and deflectable upon the application of a proximally directed force on said stopper.

10        6.     The syringe assembly of claim 1 including flush solution in said chamber.

      7.     The syringe assembly of claim 6 further including a tip cap releasably connected to said tip of said syringe barrel for sealing said passageway.

15        8.     The syringe assembly of claim 6 wherein said flush solution is selected from the group consisting of saline flush solution and heparin lock flush solution.

20        9.     The syringe assembly of claim 4 wherein said flexible base is made of material selected from the list consisting of natural rubber, synthetic rubber, thermoplastic elastomers and combinations thereof.

      10.    The syringe assembly of claim 5 wherein said resilient portion in said plunger includes a spring.

25        11.    The syringe assembly of claim 1 further comprising a needle assembly including a cannula having a proximal end, a distal end and a lumen therethrough, and a hub having an open proximal end containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being removably  
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attached to said tip of said barrel through engagement of said tip to said cavity so that said lumen is in fluid communication with said chamber.

12. An I.V. flush syringe assembly comprising:

5 a barrel having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber;

10 a plunger including an elongate body portion having a proximal end, a distal end and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel;

15 a tip cap releasably connected to said tip of said syringe barrel for sealing said passageway;

a quantity of flush solution in said chamber between said stopper and said distal wall; and

20 anti-reflux means for minimizing stopper deflection when fluid has been delivered from said chamber and said stopper is in contact with said distal wall.

25 13. The syringe assembly of claim 12 wherein said anti-reflux means includes said stopper being supported by a flexible base at said distal end of said plunger, said base being more flexible than said stopper in response to proximally directed forces on said stopper.

30 14. The syringe assembly of claim 12 wherein said anti-reflux means includes said stopper being connected to a base at said distal end of said plunger, said stopper being configured to be more flexible at its proximal end than at its distal end in response to proximally directed force on said stopper.

15. The syringe assembly of claim 12 wherein said anti-reflux means includes a resilient portion in said plunger between said proximal end and said distal end of said plunger, said resilient portion being softer than said stopper and deflectable upon the application of a proximally directed force on said stopper.

16. The syringe assembly of claim 12 wherein said flush solution is selected from the group consisting of saline flush solution and heparin lock flush solution.

17. An I.V. flush syringe assembly comprising:

a barrel having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway there through in fluid communication with said chamber;

a plunger including an elongate body portion having a proximal end, a distal end and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel;

a tip cap releasably connected to said tip of said syringe barrel for sealing said passageway;

a quantity of flush solution in said chamber between said stopper and said distal wall, said flush solution being selected from the group consisting of saline flush solution and heparin lock flush solution; and

anti-reflux means for minimizing stopper deflection when fluid has been delivered from said chamber and said stopper is in contact with said distal wall, said anti-reflux means including said stopper being supported by a flexible base at said distal end of said plunger, said base being more flexible than said stopper in response to proximally directed forces on said stopper.

18. A method of flushing a catheter comprising the steps of:

5 (a) providing a syringe assembly including a barrel having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber, a plunger including an elongate body portion having a proximal end, a distal end, and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of said stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel, a quantity of flush solution in said chamber, and anti-reflux means for minimizing stopper deflection when said flush solution has been delivered from said chamber and said stopper is in contact with said distal wall;

20 (b) providing a catheter having a proximal end, a distal end and a passageway therethrough and a housing having a hollow interior connected to said catheter and in fluid communication with said passageway, said housing having an access valve for allowing fluid communication with said hollow interior;

25 (c) placing said distal end of said catheter in a blood vessel;  
(d) engaging said elongate tip of said barrel with said access valve so that said passageway of said syringe barrel is in fluid communication with said hollow interior of said housing;

- 5 (e) applying force to said plunger to move said plunger in a distal direction with respect to said barrel so that said flush solution in said chamber flows through said passageway into said hollow chamber of said housing and through said passageway of said catheter;
- (f) continue applying force to the plunger until said stopper contacts and presses against said distal wall of said barrel.

19. A method of flushing a catheter comprising the steps of:

- 10 (a) providing a syringe assembly including a barrel having an inside surface defining a chamber for retaining fluid, an open proximal end and a distal end including a distal wall with an elongate tip extending distally therefrom having a passageway therethrough in fluid communication with said chamber, a plunger including an elongate body portion having a proximal end, a distal end, 15 and a stopper slidably positioned in fluid-tight engagement with said inside surface of said barrel for drawing fluid into and driving fluid out of said chamber by movement of the stopper relative to said barrel, said elongate body portion extending outwardly from said open proximal end of said barrel, a quantity of flush solution in said chamber, a needle assembly including a cannula having a 20 proximal end, a distal end and a lumen therethrough and a hub having an open proximal end containing a cavity and a distal end attached to said proximal end of said cannula so that said lumen is in fluid communication with said cavity, said needle assembly being attached to said tip of said barrel so that said lumen is in fluid communication with said chamber, and anti-reflux means for minimizing 25 stopper deflection when said flush solution has been delivered from said chamber and said stopper is in contact with said distal wall;
- (b) providing a catheter having a proximal end, a distal end and a passageway therethrough and a housing having a hollow interior connected to said catheter and in fluid communication with said passageway, said housing 30 having a septum for allowing fluid communication with said hollow interior;

- (c) placing said distal end of said catheter in a blood vessel;
- (d) forcing said distal end of said cannula through said septum so that said lumen is in fluid communication with said hollow interior of said housing;
- (e) applying force to said plunger to move said plunger in a distal direction with respect to said barrel so that said flush solution in said chamber flows through said passageway into said hollow chamber of said housing and through said passageway of said catheter;
- (f) continue applying force to the plunger so that said stopper contacts and presses against said distal wall of said barrel.

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